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GIRDLING AND APPLYING CHEMICALS PROMOTE RAPID ROOTING OF SYCAMORE CUTTINGS

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SOUTHERN FOREST EXPERIMENT STATION

Shoots of 6- and 13-year-old sycamore (*Platanus occidentalis* L.) were girdled and treated with rooting powder 4 weeks before cuttings were taken. The powder, which contained auxins, sucrose, and captan, was also applied basally to nongirdled cuttings immediately before insertion in a rooting medium. Thirteen days later, 100 percent of the girdled cuttings had rooted; they produced an average of 21 roots per cutting. Only 22 percent of the nongirdled cuttings rooted during this period; the average number of roots per cutting was four.

Additional keywords: Vegetative propagation, growth substances, *Platanus occidentalis* L.

INTRODUCTION

Sycamore improvement programs would be facilitated by reliable techniques of asexual propagation. Sycamore cuttings root readily when taken from juvenile ortets (Nelson and

Martindale 1957, McAlpine et al. 1972, Briscoe 1973) or from rejuvenated stump sprouts of mature trees (Kormanik and Brown 1974), but little is known of the rooting potential of nonjuvenile material (Farmer 1974). For most forest trees including sycamore, successful rooting decreases with age, and satisfactory methods for rooting cuttings of older material have not been reported. Rooting cuttings of older trees is important because juvenile characteristics are not reliable for selecting superior trees and because grafting presents incompatibility problems and affects rootstock. For 12-year-old slash pine, girdling and applying chemicals to shoots 2 months before taking cuttings proved to be a promising method of stimulating rooting (Hare 1975). The treatment, which is similar to air-layering, improves rooting by forcing the shoot to accumulate food reserves and by inducing callus formation. Unlike air-layering, however, this system promotes rapid rooting by removing the cutting to an optimal environment once callus is formed. It also eliminates damp moss, which is known to leach out growth substances (Cameron 1968). The procedure offers tree

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breeders a way to avoid grafting when building up clone banks and seed orchards.

The present experiment describes an attempt to use the girdling technique to root cuttings from 6- and 13-year-old sycamore.

MATERIALS AND METHODS

The rooting powder applied was developed previously for sycamore and other hardwoods. It contained 1 percent each IBA (indolebutyric acid) and PPZ (1-phenyl-3-methyl-5-pyrazolone), 20 percent powdered sucrose, and 5 percent captain in talc (1-1-20-5). Cuttings were obtained from twenty-two 6-year-old trees and from three 13-year-old trees growing in southern Mississippi. On May 7, 1975, when the leaves had fully expanded, two pairs of shoots were tagged in the middle and lower crown of each tree. Each pair consisted of shoots of similar size from the same branch or from one nearby. One member of each pair was girdled by removing a ring of bark 1 to 2 cm wide from the previous year's wood about 25 cm below the tip of the shoot. An aqueous slurry of the rooting powder was applied to the distal portion of each wound with a camel's hair brush; next, the girdles were covered with saran film and then with tinfoil. Although aluminum foil, which is cheaper than tinfoil, would probably be satisfactory, tinfoil has better wrapping properties.

On June 3, cuttings were taken at the distal end of the girdled shoots and 25 cm below the shoot tip of the nongirdled ones. On the same day, cutting pairs were tied together and transported to the greenhouse in plastic bags where they were dipped in water, treated basally with rooting powder, and inserted side-by-side in the propagating bed. Nongirdled cuttings received the 1-1-20-5 powder. Girdled ones were given 0-0-20-5; IBA and PPZ were omitted to avoid possible auxin inhibition of root growth where pre-formed roots were present. The cuttings were inserted 7 cm deep in perlite-vermiculite rooting medium; spacing was 15 by 15 cm. Misting nozzles automatically controlled by evaporation from a screen supplied moisture; bottom heat was provided to maintain temperatures of 24° to 27° C in the medium. Greenhouse temperatures ranged from 18° to 32° C. The experimental design was appropriate for a paired observa-

tion t-test; each of the 50 pairs consisted of one girdled and one nongirdled cutting taken from the same ortet and crown position and placed adjacent to one another in the propagating bed. All cuttings were removed after 13 days and tallied for survival, number of roots, and the presence of callus. Because of the overwhelming response to girdling, no statistical analysis was necessary.

RESULTS AND DISCUSSION

The cuttings were all living when lifted after 13 days. All of the girdled cuttings had rooted (table 1); the average number of roots per cutting was 21.5 (fig. 1). In contrast, only 22 percent of the nongirdled cuttings rooted during this time; they averaged 4.3 roots each. Although all girdled cuttings rooted, there was evidence of clonal differences in response to treatment. Girdled cuttings from the four best trees averaged 49 roots per cutting; those from the four worst averaged only seven. Only two trees showed 100 percent rooting of cuttings that did not receive the girdling treatment.

Table 1.—Rooting responses of girdled and nongirdled sycamore cuttings after (13) days in the propagating bed

Ortets		Girdled cuttings		Nongirdled cuttings	
Age (years)	Number	Rooted (percent)	Roots ¹	Rooted (percent)	Roots ¹
6	22	100	22.4	22.7	4.1
13	3	100	15.2	16.7	6.0

¹ Average number of roots per rooted cutting.

At the time they were taken from the tree, all girdled cuttings were heavily callused, and some had small roots. By lifting time, half of the nongirdled cuttings that had not rooted showed some callus. Although some of these might have rooted after a longer period in the propagation bed, their root systems would be smaller than those on girdled cuttings, and survival after planting would probably be poorer.

Girdled cuttings from 13-year-old trees usually had fewer roots than those from 6-year-old trees (table 1). However, root systems of cuttings from the older trees were adequate for planting (fig. 1).



Figure 1.—Cuttings from a 13-year-old sycamore after 13 days in the propagating bed (girdled left, nongirdled right).

With this technique, rapid greenhouse rooting of nonjuvenile foliated sycamore cuttings appears feasible if the shoots are accessible. However, for large trees whose branches are difficult to reach, it may be necessary to shoot the cuttings from the tree without girdling. These cuttings will require more time in the propagating bed and will have sparser root systems than girdled cuttings. Using 1-1-20-5 rooting powder, we obtained 22 percent rooting within 13 days for nongirdled cuttings; possibly, 50 percent would have rooted if given

more time. Improved chemical treatments are being investigated to induce adequate and rapid rooting without girdling. Another possibility is to build up clones by rooting girdled cuttings from previously grafted material.

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